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Instruments for Science from Scientists

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KEM-Net Communications Software

Your J-KEM controller contains our proprietary communications software and hardware, the combination of the two form the KEM-Net Communication System.

What is KEM-Net

KEM-Net consists of two parts, software that's built into the J-KEM digital meter that allows your PC to read and write information to and from the meter, and hardware that allows the PC to communicate with as few as 1 and up to 32 separate controllers at the same time.

KEM-Net Hardware for Networks

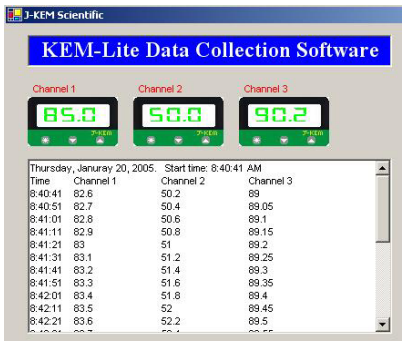
A PC's Comm port (the 9-pin connector on the back of a PC labeled Comm 1 or Comm 2) is designed to communicate with just a single digital meter, which is sufficient to communicate with a single channel temperature controller (like a Model 210) or single vacuum regulator (like a DVR 200). Applications that communicate with more than one meter (like a Gemini that has two digital meters) or multiple controllers (such as 4 different temperature controllers in 4 different hoods) require building a communications network, which is beyond the technical expertise of many researcher. KEM-Net hardware eliminates the need to build a network by automatically detecting the presence additional controllers as they are connected into the system. There is no hardware or software configuration needed, KEM-Net automatically configures the entire system as new controllers are connected.

KEM-Net Software

KEM-Net provides three software interfaces.

1. **J-KEM's KEM Comms softwar**e is a graphical Windows interface that allows you read, write and log every parameter in J-KEM's temperature and vacuum controllers. With KEM-Comms you can set PID constants and percent power output, as well as program setpoints and graphically plot (and log) time, temperature, and pressure all in a graphical Windows environment.

2. **KEM-Lite software** is a graphical Windows interface that logs time and temperature (or pressure) and allows the user to read and enter new setpoint temperatures or pressures. KEM-Lite displays real-time data on your monitor as well as logs data directly to Excel or to an ASCII flat file.



3. **User written code**. KEM-Net provides two interfaces for users who want to write their own control software, a simple ASCII protocol and an extensive Modbus protocol.

    1. **ASCII protocol.** The ASCII protocol is built into the controller to allow the user to query the most commonly accessed commands. Any user application that sends and receives ASCII characters can communicate using this protocol. Implemented commands are listed in Table 1.
    2. **Modbus Protocol**. A modbus protocol is also built into the controller. Using the modbus protocol the users software can read and write to every register in the J-KEM controller. The modbus protocol provides complete access to J-KEM's meter, but writing software that implements modbus requires a professional programmer. J-KEM will provide a developers manual for the modbus protocol on request.

ASCII Parameters and Protocol for User Written Code.

J-KEM's default communication settings are: Baud (9600), Data bits (8), Stop bits (1), Parity (None), No handshaking. The programmer must know the address of each digital meter in the system. The address and communication settings can be viewed and edited by placing the meter in programming mode then scowling to the communication level in the programming menu (see Table 2).

Table 1. Implemented Commands Using the Net-Lite Communications Protocol

Command	Controller Reply	Comments
T(*address*)\r *Address* is the address of the meter of interest and has a range of 1-247. The character '\r' represents the control character carriage return and has the HEX value of 0x13 All commands are case sensitive	85.4\r	The 'T' command requests the controller to return the current system temperature for temperature controllers, or the current system pressure for vacuum regulators. Temperature readings are returned in units of °C or °F (whatever the meter is programmed for) and in the case of pressures the units are mmHg (torr).
P(*address*)\r Address is the controller address.	75.0	The 'P' command requests the controller to return the current setpoint value. Temperature setpoints are returned in units of °C or °F (whatever the meter is programmed for) and in the case of pressures the units are mmHg (torr).
S(*address,value*)\r Address is the controller address. Value is the new setpoint value	OK\r	The 'S' command enters a new setpoint value in the controller. Temperature setpoints must be in units of °C or °F (whatever the meter is programmed for) and in the case of pressures the units are mmHg (torr). To acknowledge receive to the new setpoint, the controller replies with 'OK\r"
Error Handling **J(*address*)\r** **T(*bad address*)\r**	 ERROR\r No reply	There is no 'J' command. If an invalid command is sent to a valid address, the word ERROR is returned. If a valid command is sent to a non-existing address, no reply occurs.

Table 2. Address and Communication Settings in J-KEM Digital Meters

1	Press and hold in both the ↓ and ↑ keys on the front of the digital meter until the word "tunE" appears in the display, then release both keys.
2	Press the ↓ key until "LEVL" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↓ key until "C" appears in the display. Let go of all the keys.
3	Press the ↑ key once to display the meters address. The address can be changed by holding in the '*' key, then while holding in the '*' key press the ↓ and ↑ keys to increase of decrease the address. Each meter in a system must have a unique address.
4	Press the ↑ key once to display the meters baud rate. The baud rate can be changed by holding in the '*' key, then while holding in the '*' key press the ↓ and ↑ keys until the desired rate is set.
5	Press the ↑ key once to display the meters communication settings. Communication setting can be changed by holding in the '*' key, then while holding in the '*' key press the ↓ and ↑ keys until the desired settings are present. J-KEM's default settings are '18n1', standing for 1 start bit, 8 data bits, no parity, 1 stop bit. The only parameter that can be changed is the parity setting which can have the value of none (n), even (E) and odd (O).